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MOTOROLA, INC.
CORPORATE LAW DEPARTMENT - #56-238
3102 NORTH 56TH STREET
PHOENIX, AZ 85018

EXAMINER

LEUNG, JENNIFER A

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 01/02/2003

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/649,528

Applicant(s)

KORIPPELLA ET AL. *AB*

Examiner

Jennifer A. Leung

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 2000 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Drawings

1. The drawings are objected to because in FIG. 4, "12" should be changed to -- 100 -- for consistency with the specification, page 18, lines 5-8. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.
2. This application has been filed with informal drawings which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Specification

3. The disclosure is objected to because of the following informalities:
 - On page 9, line 17, -- or heat source -- should be inserted before "28", for consistency in terminology, as set forth in line 5.
 - On page 11, line 11, "fuel processor 10" should be changed to -- fuel processor 14 -- for proper reference to the drawings.
 - On page 13, line 16, -- or generator -- should be inserted before "50", for consistency in terminology, as set forth in line 14.
 - On page 13, line 18, the extraneous comma in "transfer," should be omitted.
 - On page 14, line 18, -- or inlet -- should be inserted before "54", for consistency in terminology, as set forth in line 8.

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4. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification. Appropriate correction is required.

Claim Objections

5. Claims 5, 7, 9, 10, 12 and 16 are objected to because of the following informalities:

In claim 5, line 2 and claim 7, line 2, "the integrated heater" should be changed to -- the integrated heat source --, for consistency in claim terminology as set forth in claims 3.

In claim 9, line 3, "a" should be omitted for proper grammatical form.

In claim 10, line 2, "an" should be change to -- a -- for proper grammatical form.

In claim 12, "the vaporizer zone" (lines 3-4) should be changed to -- the vaporization zone -- for consistency in claim terminology, as set forth in claim 11, lines 3-4.

In claim 16, "a plurality of parallel structures" (line 3) should be changed to -- a plurality of parallel channels -- (in reference to structural element 112).

Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-21 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claims 1 (lines 5-6), 11 (lines 5-6) and 18 (lines 11-12), it is unclear as to the structural relationship between "an inlet channel" and the other elements of the apparatus. Likewise, "an outlet channel".

In claim 3, it is unclear as to the structural relationship between "an integrated heat source" (line 2) and the other elements of the apparatus.

In claim 4, "the integrated heat source" (line 2) lacks proper positive antecedent basis (no integrated heat source is recited in claim 1).

In claims 7 and 15, it is unclear as to the structural relationship between the "thermally conductive structures" and the other elements of the apparatus.

In claims 13 (line 2) and 15 (line 2), "the integrated heater" lacks proper positive antecedent basis (no integrated heater is recited in claim 11).

In claims 14 and 21, applicants must first define "the integrated heater" as a "chemical heater" before reciting further structural limitations for the chemical heater. Refer to the clause, "one of... or..." set forth in claim 13, lines 2-3 and claim 20, lines 2-3.

In claim 19, it is unclear as to the relationship between "an integrated heater" (line 2) and the "an integrated heater" set forth in claim 18, line 8. Furthermore, it is unclear as to the structural relationship between the "thermally conductive channels" (line 3) and the other elements of the apparatus.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-3, 5-8, 10-16 and 18-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Hsu et al. (U.S. 5,858,314).

With respect to claim 1, Hsu et al. (FIG. 1, 2A-C) disclose a hydrogen generator comprising a ceramic carrier (column 6, lines 22-29) defining a fuel processor, said fuel processor including a reaction zone (defined by plates **14**) including a reforming catalyst **36**, an inlet channel **16** (column 4, lines 31-41) for liquid fuel, and an outlet channel **32** for hydrogen enriched gas.

With respect to claim 2, Hsu et al. further disclose the fuel processor includes a vaporization zone, namely region to "pre-heat the incoming reactants... to near operation temperatures, e.g., at least about 300° C."(column 5, lines 42-45, 64-68).

With respect to claim 3, Hsu et al. further disclose an integrated heat source (via conductive plates **12**; column 5, lines 37-42, 54-68; column 8, lines 4-column 9, line 7).

With respect to claim 5, Hsu et al. further disclose the integrated heat source is a chemical heater including a catalyst and arranged to oxidize fuel to produce heat (i.e. comprising a combustion band **92** for providing thermal energy to the endothermic reforming reactions; column 5, lines 46-68, FIG. 5. Also, in the form of a burner; column 8, line 4 - column 9, line 7).

With respect to claim 6, Hsu et al. further disclose the chemical heater includes an air inlet for providing oxygen for the oxidation of the fuel; and the inlet channel **16** includes an opening to provide fuel to the chemical heater (column 8, lines 11-16).

With respect to claim 7, Hsu et al. further disclose the integrated heater couples heat to the reaction zone using thermally conductive structures (i.e. conductive plate **12** comprising "any surface indentation or protrusions, which can be formed by embossing"; column 4, lines 46-55).

With respect to claim 8, Hsu et al. further disclose the vaporization and reaction zones comprise a plurality of parallel channels (i.e. passages formed by plates **12**, **14**; FIG. 1, 2A-C).

With respect to claim 10, Hsu et al. further disclose the ceramic carrier is a monolithic three-dimensional multi layer ceramic structure (column 6, lines 22-29).

With respect to claim 11, Hsu et al. disclose a three dimensional multi layer ceramic structure (column 6, lines 22-29) defining a fuel reformer including a vaporization zone (region to "pre-heat the incoming reactants... to near operation temperatures, e.g., at least about 300° C."; column 5, lines 42-45, 64-68) and a reaction zone (defined by reforming plates **14**; FIG. 1, 2A-C) including a reforming catalyst **36**; an inlet channel **16** (column 4, lines 31-41; FIG. 1) for liquid fuel; and an outlet channel **32** (FIG. 1) for hydrogen enriched gas.

With respect to claim 12, Hsu et al. further disclose an integrated heater thermally coupled to the reaction zone and the vaporization zone (via conductive plates **12**; column 5, lines 37-42, 54-68; column 8, lines 4-column 9, line 7).

With respect to claim 13, Hsu et al. further disclose the integrated heater is one of a chemical heater including a catalyst and arranged to oxidize fuel to produce heat (i.e. comprising a combustion band **92** for providing thermal energy to the endothermic reforming reactions; column 5, lines 46-68, FIG. 5. Also, in the form of a burner; column 8, line 4 - column 9, line 7).

With respect to claim 14, Hsu et al. further disclose the chemical heater includes an air port for providing oxygen for the oxidation of the fuel; and the inlet channel **16** includes an opening to provide fuel to the chemical heater (column 8, lines 11-16).

With respect to claim 15, Hsu et al. further disclose the integrated heater couples heat to the reaction zone using thermally conductive structures or channels (i.e. conductive plate **12**

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comprising "any surface indentation or protrusions, which can be formed by embossing"; column 4, lines 46-55).

With respect to claim 16, Hsu et al. further disclose the vaporization and reaction zones include a plurality of parallel channels (i.e. passages formed by plates **12** and **14**; FIG. 1, 2A-C).

With respect to claim 18, Hsu et al. disclose a three-dimensional multi layer ceramic carrier structure (column 6, lines 22-29) defining a fuel processor including a vaporization zone (region to "pre-heat the incoming reactants... to near operation temperatures, e.g., at least about 300° C"; column 5, lines 42-45, 64-68) and a reaction zone (defined by reforming plates **14**; FIG. 1, 2A-C) including a reforming catalyst **36**, at least one of the vaporization zone and the reaction zone include a plurality of parallel channels (i.e. passages formed by plates **12** and **14**; FIG. 1, 2A-C), the ceramic carrier further including an integrated heater (via conductive plates **12**; column 5, lines 37-42, 54-68; column 8, lines 4-column 9, line 7) thermally coupled to the reaction zone and the vaporization zone using thermally conductive structures (i.e. conductive plate **12** comprising "any surface indentation or protrusions, which can be formed by embossing"; column 4, lines 46-55); an inlet channel **16** (column 4, lines 31-41; FIG. 1) for liquid fuel; and an outlet channel **32** (FIG. 1) for hydrogen enriched gas.

With respect to claim 19, Hsu et al. further disclose the integrated heater thermally coupled to the reaction zone using thermally conductive channels (i.e. conductive plate **12** comprising "any surface indentation or protrusions, which can be formed by embossing"; column 4, lines 46-55).

With respect to claim 20, Hsu et al. further disclose the integrated heater is one of a chemical heater including a catalyst and arranged to oxidize fuel to produce heat (i.e. comprising a combustion band **92** for providing thermal energy to the endothermic reforming reactions; column 5, lines 46-68, FIG. 5. Also, in the form of a burner; column 8, line 4 - column 9, line 7).

With respect to claim 21, Hsu et al. further disclose the chemical heater includes an air port for providing oxygen for the oxidation of the fuel, and the inlet channel **16** includes an opening to provide fuel to the chemical heater (column 8, lines 11-16).

Instant claims 1-3, 5-8, 10-16 and 18-21 read structurally on the apparatus of Hsu et al.

8. Claims 1-4 and 10-13 are rejected under 35 U.S.C. 102(b) as being anticipated by Ahmed et al. (U.S. 5,942,346).

With respect to claim 1, Ahmed et al. (FIG. 1) disclose a hydrogen generator comprising: A ceramic carrier **16** defining a fuel processor, said fuel processor including a reaction zone including a reforming catalyst (column 3, line 66 to column 4, line 5), an inlet channel (via **12**, **13**) for liquid fuel, and an outlet channel ("PRODUCTS") for hydrogen enriched gas.

With respect to claim 2, Ahmed et al. further disclose the fuel processor includes a vaporization zone (column 3, lines 60-65).

With respect to claims 3 and 4, Ahmed et al. further disclose an integrated heat source **15**, wherein the heat source is a resistive heater that is electrically driven (column 3, lines 60-65).

With respect to claim 10, Ahmed et al. further disclose the ceramic carrier **16** is a monolithic three-dimensional multi layer ceramic structure (i.e. column 3, line 66 to column 4, line 5).

With respect to claim 11, Ahmed et al. (FIG. 1; column 3, line 66 to column 4, line 5) disclose a three dimensional multi layer ceramic structure **16** defining a fuel reformer including a vaporization zone and a reaction zone including a reforming catalyst, an inlet channel (via **12**, **13**) for liquid fuel, and an outlet channel ("PRODUCTS") for hydrogen enriched gas.

With respect to claims 12 and 13, Ahmed et al. further disclose an integrated heater **15** thermally coupled to the reaction zone and the vaporization zone, wherein the heater is electrically driven (column 3, lines 60-65).

Instant claims 1-4 and 10-13 read structurally on the apparatus of Ahmed et al.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

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9. Claims 4, 9 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hsu et al. (U.S. 5,858,314), as applied to claims 1 and 11 above, and further in view of Ghosh et al. (U.S. 5,961,932).

With respect to claim 4, Hsu et al. are silent as to whether the integrated heat source (via conductive plates 12) may be specifically a resistive heater that is electrically driven. However, it would have been obvious for one of ordinary skill in the art at the time the invention was made to select a resistive heater for the integrated heat source in the apparatus of Hsu et al. since the use of resistive heaters as a reaction heating means is conventionally known in the art, as evidenced by Ghosh et al. Ghosh et al. teach a three-dimensional, multi layered ceramic structure for conducting chemical reactions wherein an "embedded heating element 38 can be made from... high-temperature resistive metals or metallic alloys" and driven by electrical leads 40 (column 5, lines 19-28). In any event, it has been held that the substitution of known equivalent structures, absent showing any unexpected results, involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); *In re Ruff* 118 USPQ 343 (CCPA 1958).

With respect to claims 9 and 17, Hsu et al. disclose a plurality of channels, which may comprise "any surface indentations or protrusions, which can be formed by embossing..." (column 4, lines 46-55). However, Hsu et al. are silent as to whether the channels may comprise a serpentine shape. Ghosh et al. teach a reaction zone comprising at least one serpentine channel (column 5, lines 15-25). It would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to modify the channels of Hsu et al. such that they

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were serpentine channels because configuring serpentine, complex, wavy, winding and angular meandering forms allows variation in reaction time in the reaction zone, as taught by Ghosh et al.

10. Claims 1-3 and 5-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth (DE 197 46 251) in view of Ghosh et al. (U.S. 5,961,932). [Refer to Autenrieth U.S. 6,096,286 for English equivalent].

With respect to claim 1, Autenrieth (FIG. 1) discloses a hydrogen generator comprising: A carrier defining a fuel processor, said fuel processor including a reaction zone 2 including a reforming catalyst (inherent of reformer; U.S. '286 column 1, lines 23-27), an inlet channel 7 for liquid fuel; and an outlet channel 10 for hydrogen enriched gas. However, Autenrieth is silent as to whether the carrier is specifically ceramic. Ghosh et al. teach a ceramic, multi layered structure for defining a reaction chamber for conducting chemical reactions. It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the carrier of Autenrieth such that it were made of ceramic, since "ceramic and composite ceramic materials, in general are chemically inert and, therefore, are resistant to corrosion", and the materials "possess high strength and high hardness rendering them durable and wear resistant" (column 2, lines 66-67; column 3, lines 7-9), as taught by Ghosh et al.

With respect to claim 2, Autenrieth further discloses the fuel processor further includes a vaporization zone 1 (FIG. 1, U.S. '286 column 4, lines 32-36).

With respect to claim 3, Autenrieth further discloses an integrated heat source (combined oxidizer/burner unit 3 or catalytic burner 4; FIG. 1).

With respect to claim 5, Autenrieth further discloses the integrated heat source **3, 4** is a chemical heater including a catalyst and arranged to oxidize fuel to produce heat (U.S. '286 column 4, lines 26-column 5, line 15).

With respect to claim 6, Autenrieth further discloses the chemical heater includes an air inlet **9** for providing oxygen for the oxidation of the fuel; and the inlet channel **7** includes an opening to provide fuel to the chemical heater (U.S. '286 column 4, lines 26-column 5, line 15).

With respect to claim 7, Autenrieth further discloses the integrated heater **3, 4** couples heat to the reaction zone **2** using thermally conductive structures (U.S. '286 column 3, line 60 to column 4, line 20).

With respect to claim 8, Autenrieth further disclose the vaporization zone **1** and the reaction zone **2** include a plurality of parallel channels (FIG. 1).

With respect to claim 9, Autenrieth is silent as to whether one of the vaporization zone and the reaction zone comprises at least one serpentine channel. Ghosh et al. teach a reaction zone comprising at least one serpentine channel (column 5, lines 15-25). It would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to modify the channels of Autenrieth such that they were serpentine, because configuring such forms allows variation in reaction time in the reaction zone, as taught by Ghosh et al.

With respect to claim 10, Autenrieth further discloses the carrier is a monolithic three-dimensional multi layer structure (FIG. 1, U.S. '286 column 5, lines 16-41).

With respect to claim 11, Autenrieth disclose a three-dimensional multi layer structure (FIG. 1, U.S. '286 column 5, lines 16-41) defining a fuel reformer including a vaporization zone **1** and a reaction zone **2** including a reforming catalyst (inherent of reformer; U.S. '286 column 1,

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lines 23-27), an inlet channel 7 for liquid fuel, and an outlet channel 10 for hydrogen enriched gas. However, Autenrieth is silent as to whether the carrier is specifically ceramic. Ghosh et al. teach a ceramic, multi layered structure for defining a reaction chamber for conducting chemical reactions. It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the carrier of Autenrieth such that it were made of ceramic, since "ceramic and composite ceramic materials, in general are chemically inert and, therefore, are resistant to corrosion", and the materials "possess high strength and high hardness rendering them durable and wear resistant" (column 2, lines 66-67; column 3, lines 7-9), as taught by Ghosh et al.

With respect to claim 12, Autenrieth further disclose an integrated heater 3, 4 thermally coupled to the reaction zone 2 and the vaporization zone 1 (FIG. 1; U.S. '286 column 3, line 60 to column 4, line 20).

With respect to claim 13, Autenrieth further disclose the integrated heater 3, 4 is a chemical heater including a catalyst and arranged to oxidize fuel to produce heat (U.S. '286 column 4, lines 26-column 5, line 15).

With respect to claim 14, Autenrieth further disclose the chemical heater includes an air port 9 for providing oxygen for the oxidation of the fuel, and the inlet channel 7 includes an opening to provide fuel to the chemical heater (U.S. '286 column 4, lines 26-column 5, line 15).

With respect to claim 15, Autenrieth further discloses the integrated heater 3, 4 couples heat to the reaction zone 2 using thermally conductive structures (U.S. '286 column 3, line 60 to column 4, line 20).

With respect to claim 16, Autenrieth further disclose one of the vaporization zone 1 and the reaction zone 2 include a plurality of parallel channels (FIG. 1).

With respect to claim 17, Autenrieth is silent as to whether one of the vaporization zone **1** and the reaction zone **2** may comprise at least one serpentine channel. Ghosh et al. teach a reaction zone comprising at least one serpentine channel (column 5, lines 15-25). It would have been an obvious design choice for one of ordinary skill in the art at the time the invention was made to modify the channels of Autenrieth such that they were serpentine, because configuring such forms allows variation in reaction time in the reaction zone, as taught by Ghosh et al.

With respect to claim 18, Autenrieth disclose a three-dimensional multi layer carrier structure (FIG. 1, U.S. '286 column 5, lines 16-41) defining a fuel processor including a vaporization zone **1** and a reaction zone **2** including a reforming catalyst (inherent of reformer; U.S. '286 column 1, lines 23-27), at least one of the vaporization zone and the reaction zone including a plurality of parallel channels, the carrier further including an integrated heater **3, 4** thermally coupled to the reaction zone **2** and the vaporization zone **1** using thermally conductive structures (U.S. '286 column 3, line 60 to column 4, line 20), an inlet channel **7** for liquid fuel, and an outlet channel **10** for hydrogen enriched gas. However, Autenrieth is silent as to whether the carrier is specifically ceramic. Ghosh et al. teach a ceramic, multi layered structure for defining a reaction chamber for conducting chemical reactions. It would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the carrier of Autenrieth such that it were made of ceramic, since "ceramic and composite ceramic materials, in general are chemically inert and, therefore, are resistant to corrosion", and the materials "possess high strength and high hardness rendering them durable and wear resistant" (column 2, lines 66-67; column 3, lines 7-9), as taught by Ghosh et al.

With respect to claim 19, Autenrieth further discloses an integrated heater 3, 4 thermally coupled to the reaction zone 2 using thermally conductive channels or structures (U.S. '286 column 3, line 60 to column 4, line 20).

With respect to claim 20, Autenrieth further discloses the integrated heater 3, 4 is a chemical heater including a catalyst and arranged to oxidize fuel to produce heat (U.S. '286 column 4, lines 26-column 5, line 15).

With respect to claim 21, Autenrieth further discloses the chemical heater includes an air port 9 for providing oxygen for the oxidation of the fuel, and the inlet channel 7 includes an opening to provide fuel to the chemical heater (U.S. '286 column 4, lines 26-column 5, line 15).

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure: Dyer et al. is applicants' related PCT, and Autenrieth (U.S. '286) is an English language equivalent of DE '251 for translation purposes.

* * *

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is 703-305-4951. The examiner can normally be reached on 8:30 am - 5:30 pm M-F, every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on 703-308-6824. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9310 for regular communications and 703-872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.

Jennifer A. Leung JAL
December 19, 2002

Hien Tran
HIEN TRAN
PRIMARY EXAMINER